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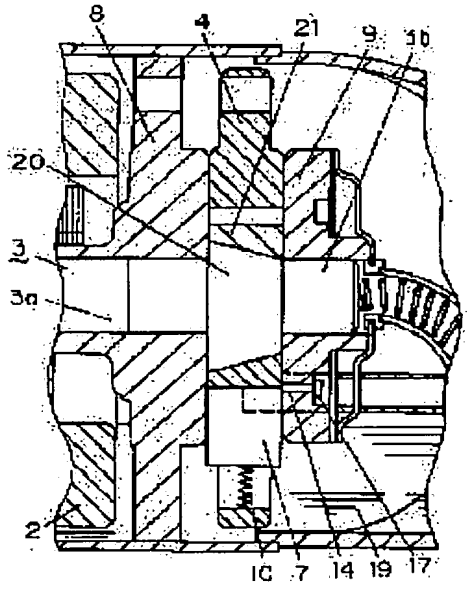
(54) ROTARY COMPRESSOR

(57)Abstract:
PURPOSE: To provide a rotary compressor which is constituted to prevent the stop of rotation of the roller of a rotary compressor, prevent the occurrence of slide wear between the roller and a vane, and provide high reliability.
CONSTITUTION: A rotary compressor comprises a cylinder 4; a vane 7 reciprocated in the cylinder 4; a roller 21 to effect rotation slide in the cylinder 4 and having an inner periphery formed in the shape of a taper in the direction of the height of the cylinder 4; and a crank 20 formed in the shape of a taper in the direction of the height of the cylinder 4 and slidably fitted in the roller 21.



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* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the rotating type hermetic type compressor used for a refrigerating plant etc.
[0002]
[Description of the Prior Art] Since the electric compression element is contained in the well-closed container and the maintenance or repair in a well-closed container cannot do the closed mold electrically-driven compressor used for a refrigerating plant etc., what has high dependability is desired strongly. Especially, the sliding section of the roller of a rotating type compressor and a blade is in a line contact condition, and is in a severe sliding condition.
[0003] Therefore, the poor lubrication of the sliding section of a roller and a blade is prevented, and the approach of raising dependability is devised from the former. For example, there is a closed mold electrically-driven compressor as shown in JP,62-199990,A.
[0004] Hereafter, an example of the conventional closed mold electrically-driven compressor mentioned above is explained, referring to a drawing.
[0005] Drawing 3 is the sectional view showing the conventional rotating type compressor, and drawing 4 is the A-A line sectional view of drawing 3 .
[0006] In drawing 3 and drawing 4 , as for sealing casing and 1a, 1 is [refrigerant-gas space and 2] electric elements, and 3 is a shaft and consists of main shaft 3a, countershaft 3b, and eccentric section 3c. 4 is a cylinder, 5 is the roller contained by eccentric section 3c of a shaft 3 free [a revolution], 6 is the blade slot established in the cylinder, and 7 is a blade which reciprocates the inside of the blade slot 6. 8 is main bearing, 9 is a countershaft carrier, and it is fixed to the end face of a cylinder 4.
[0007] 10 is the spring prepared between the tooth back of a blade 7, and the cylinder 4. 11a and 11b are the inhalatoriums and compression space which are constituted by a roller 5, blade 7 main bearing 8, and the countershaft carrier 9 within a cylinder 4, respectively. 12 is an oiling device which consists of coil-spring 12a fixed to countershaft 3b, and guide tubing 12b fixed to the countershaft carrier 9.
[0008] 13 is a suction pipe and is open for free passage with inhalatorium 11a in the inhalation section 15 through the inhalation path 14 of the countershaft carrier 9 and a cylinder 4. As for a discharge part and 17, 16 is [a discharge valve and 18] discharge tubes. 19 is a lubricating oil in the sealing casing 1.
[0009] About the rotating type compressor constituted as mentioned above, the actuation is explained below. A refrigerant gas is drawn with a suction pipe 13, the inhalation path 14, and the inhalation section 15 from a cooling system (not shown), and results in inhalatorium 11a in a cylinder 4. The refrigerant gas which resulted in inhalatorium 11a is compression space 11b divided into crank 3c of a shaft 3 by the roller 5 contained free [a revolution] and the blade 7, and is gradually compressed by the revolution of the shaft 3 accompanying a revolution of the electric element 2.
[0010] Rotation (rotation) to the core of eccentric section 3c is performed, performing a circular movement (revolution) of as opposed to [at this time / focusing on a shaft 3] the fixed system

of coordinates of main bearing 8 and countershaft carrier 9 grade in a roller 5. And when relative velocity occurs and that relative velocity is between a roller 5 and a blade 7 by this revolution and rotation, oil film generating between a roller 5 and a blade 7 is made.
[0011] Once the compressed refrigerant gas is breathed out in the sealing casing 1 through a discharge part 16 and a discharge valve 17, it is breathed out by the cooling system through a discharge tube 18.
[0012] Moreover, the lubricating oil 19 collected on the lower part in the sealing casing 1 results in countershaft 3b through coil-spring 12a fixed to countershaft 3b, and carries out the lubrication of the sliding section of a shaft 3 or a roller 5. moreover, the thing soaked in the lubricating oil 19 collected in the sealing casing 1 about between the blade slots 6 of a blade 7 and a cylinder 4 in case a blade 7 goes -- the sliding section between a blade 7 and the blade slot 6 -- lubrication -- a seal is carried out.
[0013]
[Problem(s) to be Solved by the Invention] However, rotation of a roller 5 is determined by the viscous force and frictional force of roller 5 peripheral face, a cylinder 4, a blade 7 and roller 5 end face, main bearing 8, the countershaft carrier 9 and roller 5 inner skin, and the lubricating oil that works between eccentric section 3c with the above-mentioned conventional configuration. Moreover, about the rotating type compressor which has selected cubic capacity with the height of a cylinder 4, as for what has small cubic capacity, the height of a cylinder 4 becomes low.
[0014] Among the force of opting for rotation of this roller 5, the viscous force of roller 5 inner skin and the lubricating oil which acts among eccentric section 3c acts so that rotation of a roller 5 may be promoted, and that viscous force is proportional to the surface area of the sliding section mostly. Moreover, the viscous force and frictional force of the lubricating oil which acts on the sliding section of roller 5, and cylinder 4, blade 7 and roller 5 end face, main bearing 8, or the countershaft carrier 9 act so that rotation of a roller 5 may be suspended.
[0015] Therefore, by what has small cubic capacity, when the height of a roller 5 is low, the viscous force between roller 5 inner skin which promotes rotation of a roller 5, and eccentric section 3c declines, and the direction of the viscous force and frictional force which are committed between roller 5 peripheral faces, the cylinder 4, the blade 7 and roller 5 end face, and the main bearing 8 and the countershaft carriers 9 which bar rotation of a roller 5 becomes large.
[0016] Therefore, in a thing with small cubic capacity especially with the low height of a cylinder 4, rotation of a roller 5 falls, the relative velocity of the sliding section of a roller 5 and a blade 7 falls, and oil film generating becomes difficult. Therefore, there was a fault that the sliding section of a roller 5 and a blade 7 wore a lifting and the sliding section out in metallic contact with an oil film piece.
[0017] It aims at preventing the sliding section wear by metallic contact by this invention's solving the conventional technical problem, and preventing rotation lowering of a roller 5 and preventing a roller 5 and the oil film piece between blades 7, even if the height of a cylinder 4 is low.
[0018] Moreover, the viscous force of the lubricating oil on which sliding section temperature rises on high outside-air-temperature conditions etc., the oil viscosity of the sliding section becomes quite low, and the above-mentioned conventional configuration acts between roller 5 inner circumference and eccentric section 3c may decline, and rotation of a roller 5 may fall extremely. Therefore, by high outside air temperature etc., when sliding section temperature was high, the relative velocity between a roller 5 and a blade 7 fell extremely, oil film generating between a roller 5 and a blade 7 became difficult, and there was a fault of wearing the sliding section out, with an oil film piece.
[0019] Other objects of this invention are preventing sliding section wear by preventing rotation lowering of a roller 5 and preventing a roller 5 and the oil film piece between blades 7, when the temperature of the sliding section becomes high by high outside air temperature etc.
[0020]
[Means for Solving the Problem] In order to attain this object, the hermetic type compressor of this invention carries out revolution sliding of the inside of a cylinder, the blade which

reciprocates within a cylinder, and a cylinder, and consists of cranks with which inner circumference fits in in the height direction of a cylinder free [a roller and sliding] in a taper configuration in the roller which is a taper configuration, and the height direction of a cylinder.
[0021] Moreover, it fits in free [a cylinder the blade which reciprocates within a cylinder, the eccentric section which carries out revolution sliding of the inside of a cylinder, the eccentric section, and sliding], and it is arranged by the roller which has the slot established in inner skin, and radial [of Mizouchi], and consists of flexible devices shrunken by the elevated temperature at elongation and low temperature.
[0022]
[Function] Since the hermetic type compressor of this invention carried out revolution sliding of the inside of a cylinder, the blade which reciprocates within a cylinder, and a cylinder and has formed the crank with which inner circumference fits in in the roller which is a taper configuration in the height direction of a cylinder, and the height direction of a cylinder free [a roller and sliding in a taper configuration], even if cubic capacity is small and cylinder height is low, sliding area between roller inner circumference and a crank can be enlarged.
[0023] Therefore, viscous force between roller inner skin and a crank can be enlarged, rotation lowering of a roller is prevented, and the relative-velocity lowering between a roller and a blade can be prevented. Therefore, a roller and the oil film piece between blades can be prevented, and sliding section wear can be prevented.
[0024] Moreover, a cylinder, the blade which reciprocates within a cylinder, and the eccentric section which carries out revolution sliding of the inside of a cylinder, Since the flexible device which fits in free [the eccentric section and sliding], is arranged by the roller which has the slot established in inner skin, and radial [of Mizouchi], and is shrunken by the elevated temperature at elongation and low temperature is established

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CLAIMS

[Claim(s)]
[Claim 1] The rotating type compressor with which revolution sliding of the inside of a cylinder, the blade which reciprocates within said cylinder, and said cylinder is carried out, and inner circumference consists of a roller which is a taper configuration, and a crank which fits in free [said roller and sliding] in a taper configuration in the height direction of said cylinder in the height direction of said cylinder.
[Claim 2] The rotating type compressor which consists of a flexible device which fits in free [a cylinder, the blade which reciprocates within said cylinder, the eccentric section which carries out revolution sliding of the inside of said cylinder, and said eccentric section and sliding], is arranged by the roller which has the slot established in inner skin, and radial [of said Mizouchi], and is shrunken by the elevated temperature at elongation and low temperature.

[Translation done.]

TECHNICAL FIELD

[Industrial Application] This invention relates to the rotating type hermetic type compressor used for a refrigerating plant etc.

PRIOR ART

[Description of the Prior Art] Since the electric compression element is contained in the well-closed container and the maintenance or repair in a well-closed container cannot do the closed mold electrically-driven compressor used for a refrigerating plant etc., what has high dependability is desired strongly. Especially, the sliding section of the roller of a rotating type compressor and a blade is in a line contact condition, and is in a severe sliding condition.

[0003] Therefore, the poor lubrication of the sliding section of a roller and a blade is prevented, and the approach of raising dependability is devised from the former. For example, there is a closed mold electrically-driven compressor as shown in JP,62-199990,A.

[0004] Hereafter, an example of the conventional closed mold electrically-driven compressor mentioned above is explained, referring to a drawing.

[0005] Drawing 3 is the sectional view showing the conventional rotating type compressor, and drawing 4 is the A-A line sectional view of drawing 3 .

[0006] In drawing 3 and drawing 4 , as for sealing casing and 1a, 1 is [refrigerant-gas space and 2] electric elements, and 3 is a shaft and consists of main shaft 3a, countershaft 3b, and eccentric section 3c. 4 is a cylinder, 5 is the roller contained by eccentric section 3c of a shaft 3 free [a revolution], 6 is the blade slot established in the cylinder, and 7 is a blade which reciprocates the inside of the blade slot 6. 8 is main bearing, 9 is a countershaft carrier, and it is fixed to the end face of a cylinder 4.

[0007] 10 is the spring prepared between the tooth back of a blade 7, and the cylinder 4. 11a and 11b are the inhalatoriums and compression space which are constituted by a roller 5, blade 7 main bearing 8, and the countershaft carrier 9 within a cylinder 4, respectively. 12 is an oiling device which consists of coil-spring 12a fixed to countershaft 3b, and guide tubing 12b fixed to the countershaft carrier 9.

[0008] 13 is a suction pipe and is open for free passage with inhalatorium 11a in the inhalation section 15 through the inhalation path 14 of the countershaft carrier 9 and a cylinder 4. As for a discharge part and 17, 16 is [a discharge valve and 18] discharge tubes. 19 is a lubricating oil in the sealing casing 1.

[0009] About the rotating type compressor constituted as mentioned above, the actuation is explained below. A refrigerant gas is drawn with a suction pipe 13, the inhalation path 14, and the inhalation section 15 from a cooling system (not shown), and results in inhalatorium 11a in a cylinder 4. The refrigerant gas which resulted in inhalatorium 11a is compression space 11b divided into crank 3c of a shaft 3 by the roller 5 contained free [a revolution] and the blade 7, and is gradually compressed by the revolution of the shaft 3 accompanying a revolution of the electric element 2.

[0010] Rotation (rotation) to the core of eccentric section 3c is performed, performing a circular movement (revolution) of as opposed to [at this time / focusing on a shaft 3] the

fixed system of coordinates of main bearing 8 and countershaft carrier 9 grade in a roller 5. And when relative velocity occurs and that relative velocity is between a roller 5 and a blade 7 by this revolution and rotation, oil film generating between a roller 5 and a blade 7 is made.
[0011] Once the compressed refrigerant gas is breathed out in the sealing casing 1 through a discharge part 16 and a discharge valve 17, it is breathed out by the cooling system through a discharge tube 18.
[0012] Moreover, the lubricating oil 19 collected on the lower part in the sealing casing 1 results in countershaft 3b through coil-spring 12a fixed to countershaft 3b, and carries out the lubrication of the sliding section of a shaft 3 or a roller 5. moreover, the thing soaked in the lubricating oil 19 collected in the sealing casing 1 about between the blade slots 6 of a blade 7 and a cylinder 4 in case a blade 7 goes -- the sliding section between a blade 7 and the blade slot 6 -- lubrication -- a seal is carried out.
EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, since it consists of rollers with which revolution sliding of the inside of a cylinder is carried out, and the crank which is a taper configuration, and inner circumference are taper configurations, and fit in in the height direction of a cylinder free [a crank and sliding] in the height direction of a cylinder, even if the height of this invention of a cylinder is low, it can enlarge viscous force between roller inner circumference and a crank. Therefore, since what has low cylinder height can secure rotation of a roller and can prevent lowering of the relative velocity of a roller and a blade, a roller and the oil film piece between blades can be prevented, metallic contact of the sliding section can be prevented, and sliding section wear can be prevented.
[0042] Moreover, since it consists of flexible devices which fitting is carried out to the eccentric section, are arranged by the roller which can rotate freely, the slot installed inside by roller inner skin, and radial [of Mizouchi], and are shrunken by the elevated temperature at elongation and low temperature Sliding section temperature rises during operation of a rotating type compressor, the viscosity of a lubricating oil becomes low, and even if the viscous force and frictional force between the roller which acts so that rotation of a roller may be promoted, and the eccentric section decline, a roller can be made to rotate according to the frictional force by the flexible device.
[0043] Therefore, since lowering of the relative velocity between a roller and a blade is prevented and a roller and the oil film piece of a blade can be prevented, sliding section wear can be prevented. Moreover, according to the operational status of a rotating type compressor, when sliding section temperature is not not much high, it becomes the same sliding as usual. Therefore, a roller has rotation promoted only by the viscous force and frictional force of a roller and the eccentric section, and the number of rotation does not increase extremely. Therefore, the sliding section wear by buildup of the sliding distance accompanying buildup of the relative velocity of a roller and a blade can be prevented.
TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, rotation of a roller 5 is determined by the viscous force and frictional force of roller 5 peripheral face, a cylinder 4, a blade 7 and

roller 5 end face, main bearing 8, the countershaft carrier 9 and roller 5 inner skin, and the lubricating oil that works between eccentric section 3c with the above-mentioned conventional configuration. Moreover, about the rotating type compressor which has selected cubic capacity with the height of a cylinder 4, as for what has small cubic capacity, the height of a cylinder 4 becomes low.

[0014] Among the force of opting for rotation of this roller 5, the viscous force of roller 5 inner skin and the lubricating oil which acts among eccentric section 3c acts so that rotation of a roller 5 may be promoted, and that viscous force is proportional to the surface area of the sliding section mostly. Moreover, the viscous force and frictional force of the lubricating oil which acts on the sliding section of roller 5, and cylinder 4, blade 7 and roller 5 end face, main bearing 8, or the countershaft carrier 9 act so that rotation of a roller 5 may be suspended.

[0015] Therefore, by what has small cubic capacity, when the height of a roller 5 is low, the viscous force between roller 5 inner skin which promotes rotation of a roller 5, and eccentric section 3c declines, and the direction of the viscous force and frictional force which are committed between roller 5 peripheral faces, the cylinder 4, the blade 7 and roller 5 end face, and the main bearing 8 and the countershaft carriers 9 which bar rotation of a roller 5 becomes large.

[0016] Therefore, in a thing with small cubic capacity especially with the low height of a cylinder 4, rotation of a roller 5 falls, the relative velocity of the sliding section of a roller 5 and a blade 7 falls, and oil film generating becomes difficult. Therefore, there was a fault that the sliding section of a roller 5 and a blade 7 wore a lifting and the sliding section out in metallic contact with an oil film piece.

[0017] It aims at preventing the sliding section wear by metallic contact by this invention's solving the conventional technical problem, and preventing rotation lowering of a roller 5 and preventing a roller 5 and the oil film piece between blades 7, even if the height of a cylinder 4 is low.

[0018] Moreover, the viscous force of the lubricating oil on which sliding section temperature rises on high outside-air-temperature conditions etc., the oil viscosity of the sliding section becomes quite low, and the above-mentioned conventional configuration acts between roller 5 inner circumference and eccentric section 3c may decline, and rotation of a roller 5 may fall extremely. Therefore, by high outside air temperature etc., when sliding section temperature was high, the relative velocity between a roller 5 and a blade 7 fell extremely, oil film generating between a roller 5 and a blade 7 became difficult, and there was a fault of wearing the sliding section out, with an oil film piece.

[0019] Other objects of this invention are preventing sliding section wear by preventing rotation lowering of a roller 5 and preventing a roller 5 and the oil film piece between blades 7, when the temperature of the sliding section becomes high by high outside air temperature etc.

MEANS

[Means for Solving the Problem] In order to attain this object, the hermetic type compressor of this invention carries out revolution sliding of the inside of a cylinder, the

blade which reciprocates within a cylinder, and a cylinder, and consists of cranks with which inner circumference fits in in the height direction of a cylinder free [a roller and sliding] in a taper configuration in the roller which is a taper configuration, and the height direction of a cylinder.

[0021] Moreover, it fits in free [a cylinder the blade which reciprocates within a cylinder, the eccentric section which carries out revolution sliding of the inside of a cylinder, the eccentric section, and sliding], and it is arranged by the roller which has the slot established in inner skin, and radial [of Mizouchi], and consists of flexible devices shrunken by the elevated temperature at elongation and low temperature.

OPERATION

[Function] Since the hermetic type compressor of this invention carried out revolution sliding of the inside of a cylinder, the blade which reciprocates within a cylinder, and a cylinder and has formed the crank with which inner circumference fits in in the roller which is a taper configuration in the height direction of a cylinder, and the height direction of a cylinder free [a roller and sliding in a taper configuration], even if cubic capacity is small and cylinder height is low, sliding area between roller inner circumference and a crank can be enlarged.

[0023] Therefore, viscous force between roller inner skin and a crank can be enlarged, rotation lowering of a roller is prevented, and the relative-velocity lowering between a roller and a blade can be prevented. Therefore, a roller and the oil film piece between blades can be prevented, and sliding section wear can be prevented.

[0024] Moreover, a cylinder, the blade which reciprocates within a cylinder, and the eccentric section which carries out revolution sliding of the inside of a cylinder, Since the flexible device which fits in free [the eccentric section and sliding], is arranged by the roller which has the slot established in inner skin, and radial [of Mizouchi], and is shrunken by the elevated temperature at elongation and low temperature is established Even if the temperature of the sliding section becomes high by high outside air temperature etc. and the viscosity of the lubricating oil between a roller and the eccentric section falls, the frictional force between elongation, the eccentric section, and a roller increases [the flexible device established in the roller].

[0025] Therefore, by promoting rotation of a roller, a roller and the oil film piece between blades can be prevented, and sliding section wear can be prevented.

EXAMPLE

[Example] Hereafter, it explains, referring to a drawing about the 1st example of the hermetic type compressor by this invention. In addition, about the same configuration as the former, the same sign is attached and detailed explanation is omitted.

[0027] Drawing 1 is important section drawing of longitudinal section of the rotating type compressor by the 1st example of this invention. In drawing 1 , 20 carries out revolution sliding of the inside of a cylinder 4, it is the crank which is a taper configuration in the height direction of a cylinder, and inner circumference of 21 is the roller which is a taper configuration and fits in free [a crank 20 and sliding] in the height direction of a cylinder.

[0028] About the hermetic type compressor constituted as mentioned above, the actuation is explained below. A roller 21 performs rotation to the core of a crank 20, performing revolution to main bearing 8 and the countershaft carrier 9 focusing on a shaft 3 with a revolution of the electric element 2. Since the sliding area of crank the peripheral surface of 20 yen, and roller 21 inner skin has the taper configuration in the height direction of a cylinder 4, sliding area becomes large.

[0029] And since the viscous force to the lubricating oil between a crank 20 and a roller 21 is proportional to the sliding area mostly, even if its height of a cylinder 4 is low, it can enlarge viscous force between roller 21 inner circumference and a crank 20. Therefore, since rotation lowering of a roller 21 can be prevented and lowering of the relative velocity of a roller 21 and a blade 7 can be prevented, a roller 21 and the oil film piece between blades 7 can be prevented, metallic contact of the sliding section can be prevented, and sliding section wear can be prevented.

[0030] As mentioned above, since it consists of rollers 21 with which revolution sliding of the inside of a cylinder 4 is carried out, and the crank 20 which is a taper configuration, and inner circumference are taper configurations, and fit in in the height direction of a cylinder free [a crank 20 and sliding] in the height direction of a cylinder, even if the rotating type compressor of this example has the low height of a cylinder 4, it can enlarge viscous force between roller 21 inner circumference and a crank 20.

[0031] Therefore, since rotation lowering of a roller 21 can be prevented and lowering of the relative velocity of a roller 21 and a blade 7 can be prevented, a roller 21 and the oil film piece between blades 7 can be prevented, metallic contact of the sliding section can be prevented, and sliding section wear can be prevented.

[0032] In addition, at this example, although the crank 20 and the roller 21 are made into the taper configuration, if a large sliding area can be taken, even if it will be the thing of other configurations, it cannot be overemphasized that the same effectiveness is acquired.

[0033] Next, the 2nd example of the rotating type mold compressor by this invention is explained, referring to a drawing. In addition, about the same configuration as the former, the same sign is attached and detailed explanation is omitted.

[0034] Drawing 2 is important section drawing of longitudinal section of the rotating type compressor by the 2nd example of this invention. In drawing 2 , it is the flexible device which fitting of 22 is carried out to eccentric section 3c, it is the roller which can rotate freely, 23 is the slot installed inside by roller 22 inner skin, and 24 is arranged by radial [in a slot 23], and is shrunken by the elevated temperature at elongation and low temperature. There is a shape memory alloy etc. as a flexible device 24.

[0035] About the rotating type compressor constituted as mentioned above, the actuation is explained below. Even if the temperature of a rotating type compressor rises by high outside air temperature etc. and the viscosity of the lubricating oil between a roller 22 and eccentric section 3c falls, the flexible device 24 is extended and a roller 22 is pressed to eccentric section 3c. Therefore, in the sliding section of the flexible device 24, the inner circumference of a roller 22 and the frictional force between eccentric section 3c increase through the flexible device 24. Moreover, in the circumferencial direction opposite hand of the flexible device 24, the load by which the inner circumference of a roller 22 is forced

among eccentric section 3c increases, and frictional force increases.
[0036] For this reason, sliding section temperature rises during operation of a rotating type compressor, the viscosity of the lubricating oil between a roller 22 and eccentric section 3c becomes low, and even if the viscous force and frictional force between the roller 22 which acts so that rotation of a roller 22 may be promoted, and eccentric section 3c decline, a roller 22 can be made to rotate according to the frictional force by the flexible device 24. Therefore, since lowering of the relative velocity between a blade 7 and a roller 22 can be prevented and a roller 22 and the oil film piece of a blade 7 can be prevented, sliding section wear can be prevented.
[0037] Moreover, according to the operational status of a rotating type compressor, when sliding section temperature is not not much high, eccentric section 3c and a roller 22 serve as the same sliding as usual, without the flexible device 24 pressing a roller 22 to contraction eccentric section 3c. For this reason, a roller 22 has rotation promoted only by the viscous force and frictional force of a roller 22 and eccentric section 3c, and the number of rotation does not increase extremely. Therefore, the sliding section wear by buildup of the sliding distance accompanying buildup of the relative velocity of a roller 22 and a blade 7 can be prevented.
[0038] Fitting of the rotating type compressor of this example is carried out to eccentric section 3c as mentioned above. The roller 22 which can rotate freely, Since it consists of flexible devices 24 which are arranged by radial [in the slot 23 installed inside by roller 22 inner skin and a slot 23], and are shrunken by the elevated temperature at elongation and low temperature Sliding section temperature rises during operation of a rotating type compressor, the viscosity of a lubricating oil becomes low, and even if the viscous force and frictional force between the roller 22 which acts so that rotation of a roller 22 may be promoted, and eccentric section 3c decline, a roller 22 can be made to rotate according to the frictional force by the flexible device 24.
[0039] Therefore, since a roller 22 and the oil film piece of a blade 7 can be prevented, sliding section wear can be prevented. Moreover, according to the operational status of a rotating type compressor, when sliding section temperature is not not much high, it becomes the same sliding as usual. For this reason, a roller 22 has rotation promoted only by the viscous force and frictional force of a roller 22 and eccentric section 3c, and the number of rotation does not increase extremely. Therefore, the sliding section wear by buildup of the sliding distance accompanying buildup of the relative velocity of a roller 22 and a blade 7 can be prevented.
[0040] In addition, although a shape memory alloy etc. can be considered as a flexible device 24, it cannot be overemphasized by changing the frictional force of a roller 22 and eccentric section 3c by the other approaches that the same effectiveness is acquired.
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Important section drawing of longitudinal section of the 1st example of the rotating type compressor by this invention
[Drawing 2] Important section drawing of longitudinal section of the 2nd example of the

rotating type compressor by this invention
[Drawing 3] Drawing of longitudinal section of the conventional hermetic type compressor
[Drawing 4] The A–A line sectional view of drawing 4
[Description of Notations]
3c Eccentric section
4 Cylinder
7 Blade
20 Crank
21 Roller
22 Roller
23 Slot
24 Flexible Device

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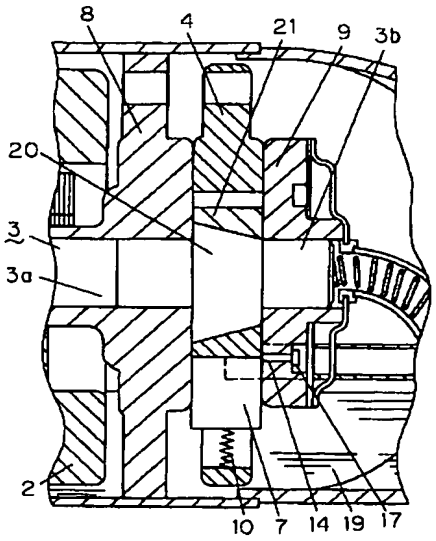
(54)【発明の名称】　回転式圧縮機

(57)【要約】

【目的】　本発明は回転式圧縮機のローラーの自転の停止を防止し、ローラーとベーンの摺動摩耗を防ぎ信頼性の高い回転式圧縮機とすることを目的とする。

【構成】　シリンダ４と、シリンダ４内で往復運動するベーン７と、シリンダ４内を回転摺動し、内周がシリンダ４の高さ方向にテーパー形状であるローラー２１と、シリンダ４の高さ方向にテーパー形状でローラー２１と摺動自在に嵌合するクランク２０とから構成されている。

4　シリンダ
7　ベーン
20　クランク
21　ローラー



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【特許請求の範囲】

【請求項１】　シリンダと、前記シリンダ内で往復運動するベーンと、前記シリンダ内を回転摺動し、内周が前記シリンダの高さ方向にテーパー形状であるローラーと、前記シリンダの高さ方向にテーパー形状で前記ローラーと摺動自在に嵌合するクランクとからなる回転式圧縮機。

【請求項２】　シリンダと、前記シリンダ内で往復運動するベーンと、前記シリンダ内を回転摺動する偏芯部と、前記偏芯部と摺動自在に嵌合し、内周面に設けられた溝を有するローラーと、前記溝内の半径方向に配設され、高温で伸び、低温で縮む伸縮機構とからなる回転式圧縮機。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、冷凍冷蔵装置等に使用される回転式密閉型圧縮機に関するものである。

【０００２】

【従来の技術】冷凍冷蔵装置等に使用される密閉型電動圧縮機は密閉容器内に電動圧縮要素が収納されており、密閉容器内のメンテナンスや修理ができないため、信頼性の高いものが強く望まれている。なかでも回転式圧縮機のローラーとベーンとの摺動部は線接触状態であり、厳しい摺動状態にある。

【０００３】そのため、ローラーとベーンの摺動部の潤滑不良を防ぎ、信頼性を高める方法が従来から考案されている。例えば特開昭６２－１９９９９０号公報に示されているような密閉型電動圧縮機がある。

【０００４】以下、図面を参照しながら、上述した従来の密閉型電動圧縮機の一例について説明する。

【０００５】図３は従来の回転式圧縮機を示す断面図であり、図４は図３のＡ－Ａ線断面図である。

【０００６】図３、図４において、１は密閉ケーシング、１ａは冷媒ガス空間、２は電動要素であり、３はシャフトで、主軸３ａ、副軸３ｂ、偏芯部３ｃからなる。４はシリンダであり、５はシャフト３の偏芯部３ｃに回転自在に収納されたローラーであり、６はシリンダに設けられたベーン溝で、７はベーン溝６内を往復運動するベーンである。８は主軸受、９は副軸受であり、シリンダ４の端面に固定される。

【０００７】１０はベーン７の背面とシリンダ４間に設けられたスプリングである。１１ａ、１１ｂはそれぞれシリンダ４内でローラー５、ベーン７主軸受８、副軸受９により構成される吸入室と圧縮室である。１２は副軸３ｂに固定されるコイルバネ１２ａと副軸受９に固定されるガイド管１２ｂで構成される給油機構である。

【０００８】１３は吸入管であり、副軸受９、シリンダ４の吸入通路１４を介して吸入部１５にて吸入室１１ａと連通している。１６は吐出部、１７は吐出弁、１８は吐出管である。１９は密閉ケーシング１内の潤滑油である。

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【０００９】以上のように構成された回転式圧縮機について、以下その動作を説明する。冷媒ガスは冷却システム（図示せず）から吸入管１３、吸入通路１４、吸入部１５と導かれシリンダ４内の吸入室１１ａに至る。吸入室１１ａに至った冷媒ガスは、シャフト３のクランク３ｃに回転自在に収納されたローラー５とベーン７により仕切られた圧縮室１１ｂで、電動要素２の回転に伴うシャフト３の回転により漸次圧縮される。

【００１０】このとき、ローラー５はシャフト３を中心に主軸受８、副軸受９等の固定座標系に対する旋回運動（公転）を行いながら、かつ、偏芯部３ｃの中心に対する回転運動（自転）を行う。そして、この公転及び自転により、ローラー５とベーン７間に相対速度が発生し、その相対速度があることによって、ローラー５とベーン７間の油膜発生がなされる。

【００１１】圧縮された冷媒ガスは、吐出部１６、吐出弁１７を介して密閉ケーシング１内に一旦吐出された後、吐出管１８を介して冷却システムに吐出される。

【００１２】また、密閉ケーシング１内の下部に溜まった潤滑油１９は、副軸３ｂに固定されたコイルバネ１２ａを介して副軸３ｂに至り、シャフト３やローラー５の摺動部を潤滑する。また、ベーン７とシリンダ４のベーン溝６間については、ベーン７が往復する際に密閉ケーシング１内に溜められた潤滑油１９に浸かることにより、ベーン７とベーン溝６間の摺動部が潤滑、シールされる。

【００１３】

【発明が解決しようとする課題】しかしながら上記従来の構成では、ローラー５の自転はローラー５外周面とシリンダ４やベーン７、ローラー５端面と主軸受８や副軸受９、及びローラー５内周面と偏芯部３ｃの間に働く潤滑油の粘性力や摩擦力によって決定される。また、気筒容積をシリンダ４の高さによって選定している回転式圧縮機については、気筒容積が小さいものはシリンダ４の高さが低くなる。

【００１４】このローラー５の自転を決定する力のうち、ローラー５内周面と偏芯部３ｃ間に作用する潤滑油の粘性力は、ローラー５の自転を促進するように作用し、その粘性力は摺動部の表面積にほぼ比例する。また、ローラー５とシリンダ４やベーン７、ローラー５端面と主軸受８や副軸受９の摺動部に作用する潤滑油の粘性力や摩擦力は、ローラー５の自転を停止するように作用する。

【００１５】そのため、気筒容積の小さいもの等でローラー５の高さが低い時には、ローラー５の自転を促進させるローラー５内周面と偏芯部３ｃ間の粘性力が低下し、ローラー５の自転を妨げるローラー５外周面とシリンダ４やベーン７、ローラー５端面と主軸受８や副軸受９の間に働く粘性力や摩擦力の方が大きくなる。

【００１６】従って、特にシリンダ４の高さが低い気筒容積の小さいものにおいて、ローラー５の自転が低下し、ローラー５とベーン７の摺動部の相対速度が低下し、油膜発生が困難となる。そのため、油膜切れによりローラー５とベーン７の摺動部が金属接触を起こし、摺動部が摩耗するという欠点があった。

【００１７】本発明は従来の課題を解決するもので、シリンダ４の高さが低いものであっても、ローラー５の自転低下を防止し、ローラー５とベーン７間の油膜切れを防止することにより、金属接触による摺動部摩耗を防ぐことを目的とする。

【００１８】また、上記従来の構成は、高外気温条件などで摺動部温度が上昇し、摺動部のオイル粘度がかなり低くなり、ローラー５内周と偏芯部３ｃ間に作用する潤滑油の粘性力が低下し、ローラー５の自転が極端に低下することがある。そのため、高外気温などで摺動部温度が高い時に、ローラー５とベーン７間の相対速度が極端に低下し、ローラー５とベーン７間の油膜発生が困難になり、油膜切れにより、摺動部が摩耗してしまうという欠点があった。

【００１９】本発明の他の目的は、高外気温などで摺動部の温度が高くなった時に、ローラー５の自転低下を防止し、ローラー５とベーン７間の油膜切れを防止することにより、摺動部摩耗を防ぐことである。

【００２０】

【課題を解決するための手段】この目的を達成するため本発明の密閉型圧縮機は、シリンダと、シリンダ内で往復運動するベーンと、シリンダ内を回転摺動し、内周がシリンダの高さ方向にテーパー形状であるローラーと、シリンダの高さ方向にテーパー形状でローラーと摺動自在に嵌合するクランクとから構成されている。

【００２１】また、シリンダと、シリンダ内で往復運動するベーンと、シリンダ内を回転摺動する偏芯部と、偏芯部と摺動自在に嵌合し、内周面に設けられた溝を有するローラーと、溝内の半径方向に配設され、高温で伸び、低温で縮む伸縮機構とから構成されている。

【００２２】

【作用】本発明の密閉型圧縮機はシリンダと、シリンダ内で往復運動するベーンと、シリンダ内を回転摺動し、内周がシリンダの高さ方向にテーパー形状であるローラーと、シリンダの高さ方向にテーパー形状でローラーと摺動自在に嵌合するクランクを設けているので、気筒容積が小さく、シリンダ高さの低いものであってもローラー内周とクランク間の摺動面積を大きくすることができる。

【００２３】従って、ローラー内周面とクランク間の粘性力を大きくすることができ、ローラーの自転低下を防止し、ローラーとベーン間の相対速度低下を防止できる。そのため、ローラーとベーン間の油膜切れを防止でき、摺動部摩耗を防止することができる。

【００２４】また、シリンダと、シリンダ内で往復運動するベーンと、シリンダ内を回転摺動する偏芯部と、偏芯部と摺動自在に嵌合し、内周面に設けられた溝を有するローラーと、溝内の半径方向に配設され、高温で伸び、低温で縮む伸縮機構を設けているので、高外気温などで摺動部の温度が高くなり、ローラーと偏芯部間の潤滑油の粘度が低下しても、ローラー内に設けられた伸縮機構が伸び、偏芯部とローラー間の摩擦力が増大する。

【００２５】従って、ローラーの自転を促進させることにより、ローラーとベーン間の油膜切れを防止でき、摺動部摩耗を防止することができる。

【００２６】

【実施例】以下、本発明による密閉型圧縮機の第１の実施例について図面を参照しながら説明する。尚、従来と同一構成については、同一符号を付して詳細な説明を省略する。

【００２７】図１は本発明の第１の実施例による回転式圧縮機の要部縦断面図である。図１において、２０はシリンダ４内を回転摺動し、シリンダの高さ方向にテーパー形状であるクランクであり、２１は内周がシリンダの高さ方向にテーパー形状であり、クランク２０と摺動自在に嵌合するローラーである。

【００２８】以上のように構成された密閉型圧縮機について、以下その動作を説明する。ローラー２１は電動要素２の回転に伴いシャフト３を中心に主軸受８、副軸受９に対する公転を行いながら、かつ、クランク２０の中心に対する自転を行う。クランク２０円周面とローラー２１内周面の摺動面積は、シリンダ４の高さ方向にテーパー形状を有しているため、摺動面積が大きくなる。

【００２９】そして、クランク２０とローラー２１間の潤滑油による粘性力は、その摺動面積にほぼ比例するため、シリンダ４の高さが低いものであっても、ローラー２１内周とクランク２０間の粘性力を大きくすることができる。従って、ローラー２１の自転低下を防止でき、ローラー２１とベーン７との相対速度の低下を防止することができるため、ローラー２１とベーン７間の油膜切れが防止でき、摺動部の金属接触を防止でき、摺動部摩耗を防止することができる。

【００３０】以上のように本実施例の回転式圧縮機は、シリンダ４内を回転摺動し、シリンダの高さ方向にテーパー形状であるクランク２０と、内周がシリンダの高さ方向にテーパー形状であり、クランク２０と摺動自在に嵌合するローラー２１で構成されているので、シリンダ４の高さが低いものであっても、ローラー２１内周とクランク２０間の粘性力を大きくすることができる。

【００３１】従って、ローラー２１の自転低下を防止でき、ローラー２１とベーン７との相対速度の低下を防止することができるため、ローラー２１とベーン７間の油膜切れが防止でき、摺動部の金属接触を防止でき、摺動部摩耗を防止することができる。

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【００３２】なお、本実施例ではクランク２０とローラー２１はテーパー形状としているが、摺動面積が広くとれるものであれば他の形状のものであっても同様の効果が得られることは言うまでもない。

【００３３】次に、本発明による回転式型圧縮機の第２の実施例について、図面を参照しながら説明する。なお、従来と同一構成については、同一符号を付して詳細な説明は省略する。

【００３４】図２は、本発明の第２の実施例による回転式圧縮機の要部縦断面図である。図２において、２２は偏芯部３ｃに嵌合され回転自在なローラーであり、２３はローラー２２内周面に内設された溝であり、２４は溝２３内の半径方向に配設され、高温で伸び、低温で縮む伸縮機構である。伸縮機構２４として、形状記憶合金等がある。

【００３５】以上のように構成された回転式圧縮機について、以下その動作を説明する。高外気温などで回転式圧縮機の温度が上昇し、ローラー２２と偏芯部３ｃ間の潤滑油の粘度が低下しても、伸縮機構２４が伸びて偏芯部３ｃにローラー２２を押圧する。そのため、伸縮機構２４の摺動部においては、伸縮機構２４を介してローラー２２の内周と偏芯部３ｃ間の摩擦力が増大する。また、伸縮機構２４の円周方向反対側では、ローラー２２の内周が偏芯部３ｃ間に押し付けられる荷重が増大し、摩擦力が増大する。

【００３６】このため、回転式圧縮機の運転中に摺動部温度が上昇し、ローラー２２と偏芯部３ｃ間の潤滑油の粘度が低くなり、ローラー２２の自転を促進するよう作用するローラー２２と偏芯部３ｃ間の粘性力や摩擦力が低下しても、伸縮機構２４による摩擦力によりローラー２２を自転させることができる。従って、ベーン７とローラー２２間の相対速度の低下を防止でき、ローラー２２とベーン７の油膜切れが防止できるため、摺動部摩耗を防止することができる。

【００３７】また、回転式圧縮機の運転状態によって、摺動部温度があまり高くない時には伸縮機構２４は縮み偏芯部３ｃに対してローラー２２を押圧することなく、偏芯部３ｃとローラー２２は従来と同様の摺動となる。このため、ローラー２２は、ローラー２２と偏芯部３ｃの粘性力や摩擦力のみで自転を促進され、自転数が極端に増大することはない。従って、ローラー２２とベーン７の相対速度の増大に伴う摺動距離の増大による摺動部摩耗を防止することができる。

【００３８】以上のように本実施例の回転式圧縮機は、偏芯部３ｃに嵌合され回転自在なローラー２２と、ローラー２２内周面に内設された溝２３と、溝２３内の半径方向に配設され、高温で伸び、低温で縮む伸縮機構２４で構成されているので、回転式圧縮機の運転中に摺動部温度が上昇し、潤滑油の粘度が低くなり、ローラー２２の自転を促進するよう作用するローラー２２と偏芯部３ｃ間の粘性力や摩擦力が低下しても、伸縮機構２４による摩擦力によりローラー２２を自転させることができる。

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【００３９】従って、ローラー２２とベーン７の油膜切れが防止できるため、摺動部摩耗を防止することができる。また、回転式圧縮機の運転状態によって、摺動部温度があまり高くない時には従来と同様の摺動となる。このため、ローラー２２は、ローラー２２と偏芯部３ｃの粘性力や摩擦力のみで自転を促進され、自転数が極端に増大することはない。従って、ローラー２２とベーン７の相対速度の増大に伴う摺動距離の増大による摺動部摩耗を防止することができる。

【００４０】なお、伸縮機構２４として形状記憶合金等が考えられるが、その他の方法にてローラー２２と偏芯部３ｃの摩擦力を変えることにより、同様の効果が得られることは言うまでもない。

【００４１】

【発明の効果】以上説明したように本発明は、シリンダ内を回転摺動し、シリンダの高さ方向にテーパー形状であるクランクと、内周がシリンダの高さ方向にテーパー形状であり、クランクと摺動自在に嵌合するローラーで構成されているので、シリンダの高さが低いものであっても、ローラー内周とクランク間の粘性力を大きくすることができる。従って、シリンダー高さの低いものでも、ローラーの自転を確保でき、ローラーとベーンとの相対速度の低下を防止することができるため、ローラーとベーン間の油膜切れが防止でき、摺動部の金属接触を防止でき、摺動部摩耗を防止することができる。

【００４２】また、偏芯部に嵌合され回転自在なローラーと、ローラー内周面に内設された溝と、溝内の半径方向に配設され、高温で伸び、低温で縮む伸縮機構で構成されているので、回転式圧縮機の運転中に摺動部温度が上昇し、潤滑油の粘度が低くなり、ローラーの自転を促進するよう作用するローラーと偏芯部間の粘性力や摩擦力が低下しても、伸縮機構による摩擦力によりローラーを自転させることができる。

【００４３】従って、ローラーとベーン間の相対速度の低下を防止し、ローラーとベーンの油膜切れが防止できるため、摺動部摩耗を防止することができる。また、回転式圧縮機の運転状態によって、摺動部温度があまり高くない時には従来と同様の摺動となる。そのため、ローラーは、ローラーと偏芯部の粘性力や摩擦力のみで自転を促進され、自転数が極端に増大することはない。従って、ローラーとベーンの相対速度の増大に伴う摺動距離の増大による摺動部摩耗を防止することができる。

【図面の簡単な説明】

【図１】本発明による回転式圧縮機の第１の実施例の要部縦断面図

【図２】本発明による回転式圧縮機の第２の実施例の要部縦断面図

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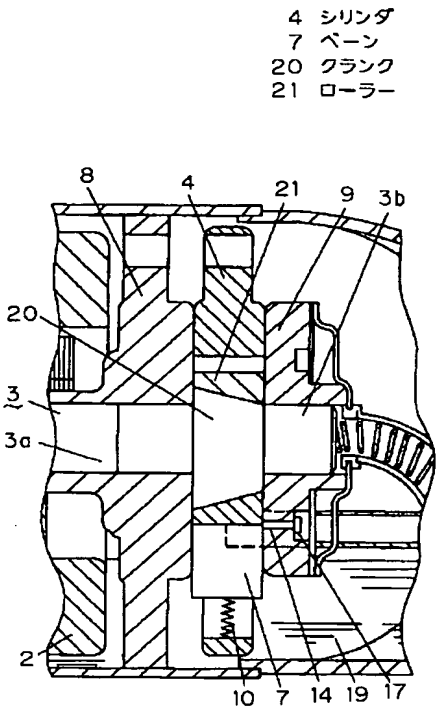
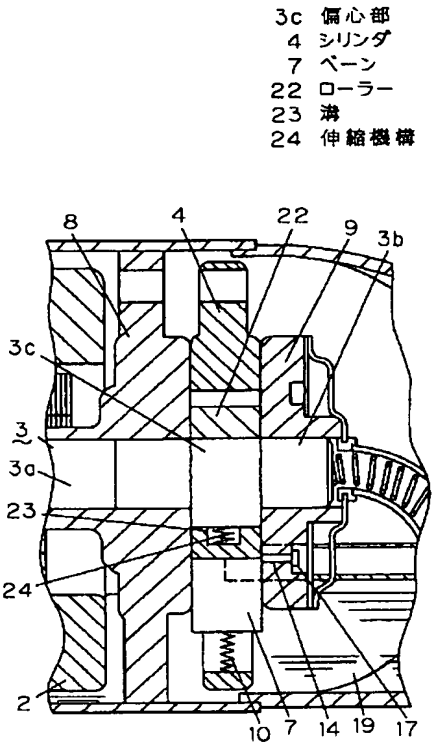
【図３】従来の密閉型圧縮機の縦断面図
【図４】図４のＡ－Ａ線断面図
【符号の説明】
３ｃ　偏芯部
４　シリンダ
７　ベーン
＊２０　クランク
２１　ローラー
２２　ローラー
２３　溝
２４　伸縮機構
＊

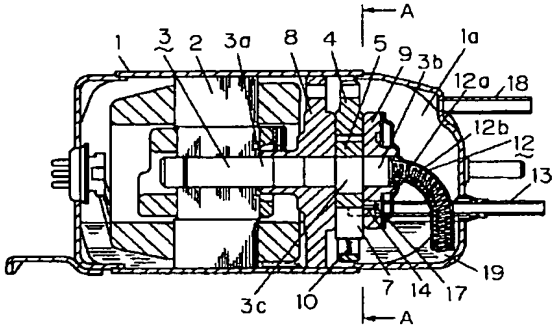
【図１】



【図２】



【図３】



【図４】